canti-cinereis, pileo nigricantiore, gula magis cinerascente: alarum pennis nigricantibus, tectricum et secundariarum marginibus externis dorso concoloribus: ventre imo cum cauda (tectricibus supra-caudalibus omnino abscondita) nigro et cervino flammulatis: rostri mandibula superiore nigricante, hujus autem tomiis cum mandibula inferiore flavidis: pedibus carneis.

Long. tota 8·5, alæ 5·5, caudæ 1·3, rostri a rictu 1·1, tarsi 1·9.

Hab. In Nov. Grenada interiore (Bogota).

Mus. P. L. S.

I obtained a single specimen of this Tinamou out of a large collection of Bogota skins in the hands of a dealer. I have in vain attempted to find a name for it, and have looked through the examples of these birds in the great Museums of Leyden, Paris and Philadelphia without finding a similar one. In the British Museum, however, is a specimen possibly referable to the young stage of this species.

The present bird agrees in size and shape tolerably well with *T. parvirostris* and *T. tataupa*, but is quite different in colouring from any member of the group with which I am acquainted.

ROYAL SOCIETY.

January 14, 1858.—The Lord Wrottesley, President, in the Chair.

"On the Electrical Nature of the Power possessed by the *Actiniæ* of our Shores," By Robert M'Donnell, M.D., M.R.I.A.

After referring to the well-known phænomena manifested by electrical fishes, and to alleged instances of numbing effects, but of doubtful electrical nature, produced on the naked hand by the contact of certain marine Invertebrata, the author describes his own observations and experiments with the Actinia as follows :—

Suppose that into a vessel containing some Actiniæ well expanded, and apparently on the look-out for food, some of the tadpoles of the common frog be introduced, these little creatures do not, like many freshwater fishes of about the same dimensions, immediately die; on the contrary, the salt water seems to stimulate their activity, they become very lively and swim about with vivacity. One of them may not unfrequently be observed to make its way among the tentacles of an Actinia and get off again quite uninjured; it may even for a time nestle among the tentacles with as much impunity as if it were only in contact with a piece of sea-weed; but should the tadpole have the misfortune to fall in with a more voracious Actinia, the reception it meets with is very different. Sometimes, when by an incautious lash of its tail it touches even a single tentacle, it may at once be laid hold of, and in the violent efforts which it forthwith makes to break loose, often merely brings itself within the reach of other tentacles, by which it is seized and overpowered. Occasionally, however, after having been thus seized, the tadpole by its superior activity succeeds in effecting its escape, and when it does so, it seems for a time singularly excited; it twists and writhes and wriggles through the water, so as to leave no doubt that some very remarkable influence has been exerted upon it.

These observations are no doubt familiar to all who have studied the habits of these animals; for although the tadpole seems more susceptible of the peculiar stimulus which the Actinia can communicate than most of those creatures which are ordinarily cast in its way, yet the same occurrences take place with the small crustaceans, &c. which are abundant in sea-water. Indeed no very close attention is necessary to perceive, that while on some occasions these little animals may creep to and fro over the surface and among the tentacles of the Actinia, at other times they are seized and killed with the greatest promptitude.

It remained to be determined what is the exact nature of the power which the Actinia has been thus found to have under its control. If it seized its victim by a simple mechanical effort, why should the tadpole be so agitated for some time after having escaped from its grasp? No peculiarly viscid secretion could be detected on the tentacles, nor could any decided reaction be discerned on their surface differing from the feebly alkaline condition of the sea-water in which they were placed; moreover, the power of the Actinia seemed often to be exerted with too much promptness to be compatible with the notion of the formation of a poisonous or stinging fluid over its surface.

On the hypothesis that it is an electrical power with which the Actiniæ are endowed, it is obvious that the existence of animal electricity in them ought to be experimentally demonstrable by its physiological effects, inasmuch as these phænomena are the most striking which animal electricity is capable of producing in common with other electricities derived from different sources.

The following experiments, in which the frog's limb was used as a galvanometer (the limb of this animal being, as is well known, an instrument of extreme delicacy for this purpose), seem satisfactorily to establish the fact that the common Actiniæ of our shores are gifted with electrical power.

1st. Having prepared the lower limb of a lively frog after the mode described by Matteucci, by stripping off the skin, dissecting out the sciatic nerve from among the muscles of the thigh, and then cutting off the thigh a little above the knee, so as to leave the nerve uninjured and as long as possible, the limb was laid on a small piece of glass, so that the nerve hung down over its edge. The pendent nerve was lowered into the water and gently brought in contact with the tentacles of an expanded Actinia. From the first or the second, or even several, possibly no effect may result, but arriving at last at one more vigorous than his neighbours, smart muscular contractions follow as he grasps the nerve in his tentacles, and the toes are thrown into active movement.

2nd. The next experiment, although of precisely the same nature as that first detailed, renders the effect produced on the muscles of the frog's limb more striking. A large and lively frog is killed, the skin is stripped off, and the viscera being removed, the body is cut off about the middle; a knife being slipped behind the lumbar plexus of nerves, the pelvic bones and contiguous soft parts are cut away, so that the lumbar vertebræ remain connected with the lower extremities merely by the nervous cords passing to each limb. Thus prepared, the limbs are laid on a thin piece of board, so that the vertebræ hang over its edge dangling by the undivided nerves. The piece of board is placed floating on the surface of the water in which are the Actiniæ, and is slowly pushed over within reach of an active one. Immediately that the Actinia seizes the morsel thus offered to it, contractions are observed to commence in the thigh, extend to the calf, and soon the toes are in movement.

3rd. In order to set aside the supposition that these muscular contractions might be the result of chemical or mechanical irritation applied to the extremities of the nerves, it became necessary to devise a modification of the foregoing experiments; for although irritants, such as turpentine, croton oil, ammonia, friction with a nettle leaf, &c., were applied to the nerves without producing any effect like that obtained from the Actiniæ, it seemed still possible that the contractions might be due to some other agent than electricity.

The following experiment seems to remove all doubt. A piece of copper wire, a few inches long, was coated with sealing-wax, except about half an inch at each end; the ends were rubbed clean with sand-paper, one of them was thrust into the lower part of the spinal canal of a frog prepared as in the last experiment, while the other, which was to be offered to an Actinia, was passed into a portion of the frog's intestine put on like a glove; for the Actinia does not seize vigorously metallic substances. The limbs of the frog with the nerves and vertebræ attached, are laid on a piece of board, while the copper wire, which is curved, arches over the edge of it; so that the end covered with frog's intestine can be readily brought within the reach of the Actinia. Having waited for a few minutes until the muscular contractions excited by thrusting the wire into the spinal canal have ceased (and they are in general very transient), the board is placed floating on the water, and the frog's intestine offered to an Actinia; muscular contractions ensue, perhaps not so promptly, certainly not so vigorously as in the former experiments, but nevertheless easily to be recognized and unmistakeable. They commence in the thighs, and, as in the former case, extend to the calves, and then the toes move actively. This last experiment has been modified in a variety of ways, but the same result has been constantly obtained. Perhaps the best modification of it is to use a piece of copper wire having one end coiled so as to form a disk which is covered with chamois-leather, while the other is sharp-pointed to enter the spinal canal of the frog. The whole, except the surface of the disk, which is to be given to the Actinia, and the point for the spinal canal, is covered with sealing-wax, and the frog's limbs extended upon a thin piece of board. With this arrangement precisely the same effects were produced as already described.

It is a remarkable fact, and deserves special notice, that in all these experiments the muscular contractions, when once strongly excited, whether by direct contact or through the medium of wire, do *not* at once subside. When the limbs are withdrawn from the influence of the Actinia in the first experiments, or removed from the wire in the last, strong muscular contractions continue to take place for from three to five minutes.

All the varieties of Actinia which have hitherto been made the subject of experiment, have given similar evidence of electrical power, but by no means in an equal degree. The large varieties are found, in proportion to their size, much feebler than those of less dimensions, and any attempt to succeed in the experiment with the copper wire has failed with them.

A somewhat similar observation has been made by Dr. John Davy regarding the Torpedo, for he tells us (Philosophical Transactions, 1834, p. 548) that he has seen strong vivacious fish which made great muscular exertions in the water, almost or entirely destitute of electrical action.

It is obvious that in creatures of such moderate dimensions as Actiniæ, of so peculiar a form and of such feeble power, much difficulty is to be expected in demonstrating the other experimental effects which animal electricity is capable of producing in common with other electricities, viz. magnetic deflection,—magnetising of needles,—spark,—heating power, and chemical action ; and it must be admitted that all experiments hitherto undertaken on this subject have been attended with negative results. I hope, and indeed expect, when further opportunities are afforded of examining these creatures in health and vigour in their native pools, to obtain more satisfactory results on these points, when I shall look forward to the pleasure of making a further communication on the subject.

February 4, 1858.—The Lord Wrottesley, President, in the Chair.

"Researches on the Poison-apparatus in the *Actiniadæ.*" By Philip Henry Gosse, Esq., F.R.S.

The organs which have been termed "thread-cells," "thread-capsules," "urticating organs," "lasso-cells," &c., I propose to call *cnidæ.* They are found in various tissues of the body, but are specially localized in two sets of organs, which I call *craspeda* and *acontia.* The *craspeda* are gelatinous cords connected throughout their length with the free edges of the muscular septa. The *acontia* are somewhat similar cords, but free throughout, except at their base, where they are inserted into the septa. The cord-like appearance of these latter organs is, however, illusory, as each is a narrow ribbon with involute margins. Both the *craspeda* and the *acontia* are composed of a clear plasma, in which many *cnidæ* are crowded.

The *craspeda* appear to be universally possessed by this tribe of animals, but the *acontia* are limited to a few genera, principally *Sagartia* and *Adamsia.* They are ejected from the body of the animal, and are again withdrawn.

For the emission of these organs special orifices exist, which I term *cinclides.* These are minute perforations of the muscular coats and the integument, bearing a resemblance in appearance to the spiracles of insects. Being placed in the interseptal spaces, they have a perpendicular arrangement, but are not regularly disposed in any other respect. They can be opened widely, or perfectly closed at the will of the animal; and are well seen, under a low power of the microscope, when a *Sagartia bellis* or *dianthus* is much distended in a parallel-sided glass vessel, with a strong light behind it. The width of these orifices varies from $\frac{1}{300}$th to $\frac{1}{50}$th of an inch. No ciliary current passes through them.

Under irritation the *Sagartia* forcibly and repeatedly contracts its body, forcing out the water which had distended its aquiferous canals and the general cavity of the body. Much of the fluid finds vent at these foramina, carrying with it the free floating part of some or other of the numerous *acontia*, each through that *cinclis* which happens to lie nearest to it. The frequency with which the *acontia* escape in a *loop* or *bight*, shows that the issue is the result of a merely mechanical action, viz. that of the escaping water.

The *cnidæ* occur under four distinct forms. 1. Chambered cnidæ (*Cnidæ cameratæ*). This is the most widely distributed, and the most elaborately armed. In *Cyathina Smithii* they occur of comparatively large size, and are therefore well suited for observation. They are transparent, colourless vesicles, of a long, oval figure, $\frac{1}{260}$th of an inch in length, and $\frac{1}{2000}$th in diameter. A fusiform chamber passes through the centre of the anterior moiety, merging at one extremity into the walls of the *cnida*, and at the other diminishing to a slender chord, which is irregularly coiled within the general cavity.

Under stimulus the *cnidæ* suddenly expel their contents with great force. In general the eye can scarcely follow the excessive rapidity with which the chamber and its twining thread are shot forth. When fully expelled, the thread, which I distinguish by the term *ecthoræum*, is often thirty times as long as the *cnida*; but in *Sagartia* generally, it frequently is not more than once and a half the length of the *cnida*.

In the *ecthoræum* from *chambered cnidæ* the basal portion is distinctly swollen; thence, becoming attenuated, it runs on as an excessively slender wire of equal diameter. Around this basal part wind one or more spiral thickened bands, varying, in different species, as to their number, the number of volutions made by each, and the angle which the spiral forms with the axis. The direction is from east to north. The spiral armature I call the screw, or *strebla*. There is no other form of armature than this.

These thickened spiral bands afford insertion to a series of fine *setæ*, which I call *pterygia*. These are from eight to twelve in a single volution, and they project in a diagonal direction from the *ecthoræum*, but often become reverted. In some cases, perhaps in all, the *strebla* and the *pterygia* are continued beyond the swollen portion of the *ecthoræum*, even to the end of the attenuated part.

2. Tangled cnidæ (*Cnidæ glomiferæ*). This sort differs from the preceding chiefly in the uniform slenderness of the *ecthoræum*, which lies coiled up more or less regularly in the *cnida*, without any

chamber. *Corynactis viridis* affords excellent examples for observation.

3. Spiral cnidæ (*Cnidæ cochleatæ*). The walls of the tentacles, in a few species, contain very elongated fusiform *cnidæ*, which seem composed of a slender thread coiled up in a very close and regular spiral, bearing a resemblance to the shell of a *Cerithium*. The *ecthoræum* is discharged reluctantly, and the wall of the *cnida* is very subtile.

4. Globate cnidæ (*Cnidæ globatæ*)? These are globose vesicles found in the *acontium* of *S. parasitica*, which have some characters in common with the *cnidæ*, but of whose real nature I am doubtful.

In the indubitable *cnidæ* the emission of the *ecthoræum* is a process of eversion. This is proved by many circumstances, such as the order in which the portions are evolved, the basal portion first; as well as by direct observation, the terminal part of the *ecthoræum* being occasionally detected in running out through the centre of the portion already evolved.

The *cnidæ* are filled with a fluid, which holds organic corpuscles in suspension, and these are seen driven rapidly through the *ecthoræum* in the process of eversion. I conclude that in this fluid resides the expansile force, which, on the excitement of a suitable stimulus, distends and projects the tubular portion of the wall that has hitherto been inverted.

All of the four kinds of *cnidæ* enumerated have been at various times seen surrounded by a membranous investiture, which I distinguish as the *peribola*. This coat must be ruptured before the *cnida* can emit the *ecthoræum*.

Several experiments show that the *ecthoræum* has the power of penetrating the tissues of other creatures and even of the Vertebrata. In some of these experiments shavings of human cuticle, presented for an instant to the tentacles of *Bunodes crassicornis*, and to the *acontium* of *S. parasitica*, were found on examination to be pierced through with numerous *cnidæ*.

Experiments with blue vegetable juices were instituted, with a view to test the acid or alkaline properties of the poisonous fluid supposed to be ejected on the discharge of the *ecthoræum*; but with no definite result. The existence of such a poisonous fluid is inferred, however, with a degree of probability amounting to moral certainty, and that of such concentrated power as, under certain circumstances, to destroy life with great rapidity, even in vertebrate animals.

Admitting the existence of a venomous fluid, it is difficult to determine where it is lodged, and how it is injected. I incline to the hypothesis, that the cavity of the *ecthoræum* in its primal inverted condition, while it yet remains coiled up in the *cnida*, is occupied with the poisonous fluid, and that it is poured out gradually, within the tissues of the victim, as the evolving tip of the wire penetrates farther and farther into the wound.